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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/052,500
Filing Date: January 23, 2002
Appellant(s): KAGAN ET AL.

Kagan Michael
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 23, 2007 appealing from the Office action mailed Feb. 23, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

_ Gronke U.S. Patent No. 6,888,792.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the to the appealed claims

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 – 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Gronke U.S. Patent No. 6,888,792

2. As to claim 1,Gronke teaches a method for communication over a network, comprising: assigning one or more doorbell addresses on a network interface adapter for use by a host processor (see co. 2 line 56 – col. 3 line 22 and fig.1B, Gronke discloses many descriptors that include address segments);

writing a first descriptor to a system memory associated with the host processor, the first descriptor defining a first message to be sent over the network; writing a

command to a first one of the doorbell addresses instructing the adapter to read and execute the first descriptor(see co. 2 line 56 – col. 3 line 22 and fig.1B, Gronke discloses descriptors that identify send/receive operation);

writing a second descriptor to a second one of the doorbell addresses, the second descriptor defining a second message to be sent over the network (see co. 2 line 56 – col. 3 line 22 and fig.1B, Gronke discloses descriptors that identify send/receive operation);

responsive to the command having been written to the first one of the doorbell addresses, reading the first descriptor from the system memory using the network interface adapter, and sending the first message from the network interface adapter over the network responsive to the first descriptor (see col. 2 line 56 – col. 3 line 32 and fig. 1 B, Gronke discloses sending from network interface to a network); and

responsive to the second descriptor having been written to the second one of the doorbell addresses, sending the second message from the network interface adapter over the network(see col. 2 line 56 – col. 3 line 32 and fig. 1 B, Gronke discloses sending from network interface to a network).

As to claim 2, Gronke teaches a method according to claim 1, wherein assigning the one or more doorbell addresses comprises allocating a priority area for writing the descriptors within an address range defined by the one or more doorbell addresses, and wherein writing the second descriptor comprises writing the second descriptor to the priority area (see col. 9 lines 42 – 58).

As to claim 3, Gronke teaches a method according to claim 2, wherein writing the second descriptor to the priority area comprises writing the second descriptor after writing the command to the first one of the doorbell addresses, and wherein sending the second message comprises, responsive to writing the second descriptor to the priority area, sending the second message before sending the first message (see col. 9 lines 42 – 64).

As to claim 4, Gronke teaches a method according to claim 2, wherein writing the second descriptor comprises writing the second descriptor to the system memory, as well as to the priority area, and wherein sending the second message comprises, when the second descriptor is successfully written in its entirety to the priority area, executing the second descriptor written to the priority area without reading the second descriptor from the system memory(see col. 9 lines 42 – 64).

As to claim 5, Gronke teaches a method according to claim 1, wherein writing the first and second descriptors comprises indicating first and second ranges of data to be read from the system memory for inclusion in the first and second messages, respectively, and wherein sending the first and second messages comprises reading the data from the first and second ranges responsive to the first and second descriptors(see col. 9 lines 42 – 64).

As to claim 6, Gronke teaches a method according to claim 5, wherein reading the data comprises reading the data using direct memory access (DMA) by the network interface adapter to the system memory(see col. 3 lines 58 – col.4 line 13).

As to claim 7, Gronke teaches a method according to claim 1, wherein assigning the one or more doorbell addresses comprises assigning first and second doorbell addresses respectively to first and second processes running on the host processor, and wherein writing the command comprises writing the command to the first doorbell address using the first process, and writing the second descriptor comprises writing the second descriptor to the second doorbell address using the second process (see col. 3 line 58 – col.4 line 13).

As to claim 8, Gronke teaches a method according to claim 1, wherein sending the first and second messages comprises sending one or more data packets over the network for each of the messages (see col. 5 lines 47 – 62).

As to claim 9, Gronke teaches a method according to claim 8, wherein the network comprises a switch fabric, and wherein the network interface adapter comprises a host channel adapter (HCA), and wherein writing the first and second descriptors comprises submitting work requests (WRs) for execution by the HCA. (see col. 2 line 49 – col. 3 line 22 and fig. 3).

As to claim 10, Gronke teaches a method for direct memory access (DMA), comprising: writing a first descriptor to a system memory associated with a host processor, the first descriptor defining a first operation for execution by a DMA engine(see col. 3 lines 33 – 57); writing a command to a first doorbell address of the DMA engine, instructing the engine to read and execute the first descriptor(see col. 3 line 58 – col. 4 line 13); writing a second descriptor to a second doorbell address of the DMA engine, the second descriptor defining a second operation for execution by the

DMA engine(see col. 3 line 58 – col. 4 line 13); responsive to the command written to the first doorbell address, reading the first descriptor from the system memory and executing the first descriptor using the DMA engine (see col.3 line 58 – col. 4 line 13); and responsive to the second descriptor having been written to the second doorbell address, executing the second descriptor using the DMA engine (see col.3 line 58 – col. 4 line 13).

As to claim 11, Gronke teaches a method according to claim 10, wherein writing the second descriptor comprises writing the second descriptor to a priority area allocated for writing the descriptors within an address range of the doorbell addresses (see col.9 lines 42 – 58).

As to claim 12, Gronke teaches a method according to claim 11, wherein writing the second descriptor to the priority area comprises writing the second descriptor after writing the command to the first doorbell address, and wherein executing the second descriptor comprises, responsive to writing the second descriptor to the priority area, executing the second descriptor before executing the first descriptor(see col.9 lines 42 – 58).

As to claim 13, Gronke teaches a method according to claim 11, wherein writing the second descriptor comprises writing the second descriptor to the system memory, as well as to the priority area, and wherein executing the second descriptor comprises, when the second descriptor is successfully written in its entirety to the priority area, reading and executing the second descriptor written to the priority area using the DMA

engine, without reading the second descriptor from the system memory(see col.9 lines 42 – 58).

As to claim 14, Gronke teaches a method according to claim 10, wherein writing the first and second descriptors comprises indicating first and second address ranges, respectively, in the system memory, and wherein executing the first and second descriptors comprises at least one of a scatter step, comprising conveying data from a data source to at least one of the first and second address ranges, and a gather step, comprising conveying data from at least one of the first and second address ranges to a data target (see col.9 lines 42 – 58).

As to claim 15, Gronke teaches a network interface adapter, for coupling a host processor to a communication network, the adapter comprising:

a range of doorbell addresses in an address space of the host processor, the range including first and second doorbell addresses (56 – col. 3 line 22 and fig.1B);

execution circuitry, adapted to send messages over the network responsive to descriptors prepared by the host processor, the descriptors including first and second descriptors (see col. 9 line 42 – 64 fig. 3); and

a doorbell handler, which is coupled to the range of doorbell addresses so as to receive a command written by the host processor to the first doorbell address, indicating that the first descriptor has been written to a system memory associated with the host processor, the first descriptor defining a first one of the messages, and so as to receive the second descriptor written by the host processor to the second doorbell address, the second descriptor defining a second one of the messages, the doorbell handler being

further coupled, responsive to the command having been written to the first doorbell address, to instruct the execution circuitry to read the first descriptor from the system memory and to execute the first descriptor so as to send the first one of the messages, and responsive to the second descriptor having been written to the second doorbell address, to pass the second descriptor to the execution circuitry and to instruct the execution circuitry to execute the second descriptor so as to send the second one of the messages (see col. 9 lines 42 – 64 and figs. 9 and 1B).

As to claim 16, Gronke teaches an adapter according to claim 15, wherein the second doorbell address is in a priority area within the address range, allocated for writing the descriptors thereto by the host processor (see col. 9 lines 42 – 64 and fig. 9).

As to claim 17, Gronke teaches an adapter according to claim 16, wherein the execution circuitry comprises a scheduler, which is adapted to determine an order of execution of the descriptors by the execution circuitry, and wherein responsive to the second descriptor having been written to the priority area, the doorbell handler is adapted to place the second descriptor in the order for execution ahead of the first descriptor(see col. 9 lines 42 – 64 and fig. 9).

As to claim 18, Gronke teaches an adapter according to claim 16, wherein the second descriptor is written by the host processor to the system memory, as well as to the priority area, and wherein the doorbell handler is adapted, when the second descriptor is successfully written in its entirety to the priority area, to pass the second descriptor to the execution circuitry without instructing the execution circuitry to read the second descriptor from the system memory(see col. 9 lines 42 – 64 and fig. 9).

As to claim 19, Gronke teaches an adapter according to claim 15, wherein the first and second descriptors indicate first and second ranges of data to be read from the system memory for inclusion in the first and second messages, respectively, and wherein the execution circuitry is adapted to read the data from the first and second ranges responsive to the first and second descriptors(see col.9 lines 42 – 58).

As to claim 20, Gronke teaches an adapter according to claim 19, wherein the execution circuitry comprises a gather engine, which is coupled to read the data by direct memory access (DMA) to the system memory(see col.3 line 56 – col. 4 line 13).

As to claim 21, Gronke teaches an adapter according to claim 15, wherein the first and second doorbell addresses are assigned respectively to first and second processes running on the host processor, and wherein the command is written to the first doorbell address using the first process, and the second descriptor is written to the second doorbell address using the second process(see col. 2 line 56 – col. 3 line 32).

As to claim 22, Gronke teaches an adapter according to claim 15, wherein the execution circuitry is adapted to send the first and second messages by generating data packets to send over the network for each of the messages.

As to claim 23, Gronke teaches an adapter according to claim 22, wherein the network comprises a switch fabric, and wherein the network interface adapter comprises a host channel adapter (HCA), and wherein the first and second descriptors comprise work requests (WRs) submitted by the host processor for execution by the HCA.(see col. 2 line 49 – col. 3 line 22).

As to claim 24, Gronke teaches a host channel adapter, for coupling a host processor to a switch fabric, the adapter comprising:

a range of doorbell addresses in an address space of the host processor, the range including first and second doorbell addresses(56 – col. 3 line 22 and fig.1B);

execution circuitry, adapted to generate data packets for transmission over the network responsive to work requests prepared by the host processor, the work requests including first and second work requests(see col. 9 line 42 – 64 fig. 3); and

a doorbell handler, which is coupled to the range of doorbell addresses so as to receive a command written by the host processor to the first doorbell address, indicating that the first work request has been written to a system memory associated with the host processor, and so as to receive the second work request written by the host processor to the second doorbell address, the doorbell handler being further coupled, responsive to the command having been written to the first doorbell address, to pass instructions to the execution circuitry to read the first work request from the system memory and to execute a first work queue element corresponding to the first work request so as to generate the data packets called for by the first work request, and responsive to the second work request having been written to the second doorbell address, to pass a work queue element corresponding to the second work request to the execution circuitry and to instruct the execution circuitry to execute the second work queue element so as to generate the data packets called for by the second work request(see col. 9 lines 42 – 64 and figs. 9 and 1B).

As to claim 25, Gronke teaches a direct memory access (DMA) device, comprising:

a range of doorbell addresses in an address space of a host processor, the range including first and second doorbell addresses(56 – col. 3 line 22 and fig.1B);

a DMA engine, adapted to access a system memory associated with the host processor, responsive to descriptors prepared by the host processor, the descriptors including first and second descriptors defining respective first and second operations for execution by the DMA engine(see col. 3 lines 58 – col.4 line 13); and

a doorbell handler, which is coupled to the range of doorbell addresses so as to receive a command written by the host processor to the first doorbell address, indicating that the first descriptor has been written to the system memory, and so as to receive the second descriptor written by the host processor to the second doorbell address, the doorbell handler being further coupled, responsive to the command having been written to the first doorbell address, to instruct the DMA engine to execute the first operation responsive to the first descriptor in the system memory, and responsive to the second descriptor having been written to the second doorbell address, to instruct the DMA engine to execute the second operation(see col. 9 lines 42 – 64 and figs. 9 and 1B).

As to claim 26, Gronke teaches a device according to claim 25, wherein the second doorbell address is in a priority area within the address range, allocated for writing the descriptors thereto by the host processor(see col. 9 lines 42 – 64 and fig. 9).

As to claim 27, Gronke teaches a device according to claim 26, and comprising a scheduler, which is adapted to determine an order of execution of the operations by

the DMA engine, and wherein responsive to the second descriptor having been written to the priority area, the doorbell handler is adapted to place the second operation in the order for execution ahead of the first operation. (see col. 9 lines 42 – 64 and fig. 9) .

As to claim 28, Gronke teaches a device according to claim 26, wherein the second descriptor is written by the host processor to the system memory, as well as to the priority area, and wherein the doorbell handler is adapted, when the second descriptor is successfully written in its entirety to the priority area, to pass the second descriptor to the DMA engine for execution without reading the second descriptor from the system memory. (see col. 9 lines 42 – 64 and fig. 9).

As to claim 29, Gronke teaches a device according to claim 25, wherein the first and second descriptors indicate first and second address ranges, respectively, in the system memory, and wherein the first and second operations executed by the DMA engine comprise at least one of a scatter operation, comprising conveying data from a data source to at least one of the first and second address ranges, and a gather operation, comprising conveying data from at least one of the first and second address ranges to a data target. (see col.9 lines 42 – 58).

(10) Response to Argument

The examiner summarizes the various points raised by appellant and addresses replies individually.

As per appellant arguments filed on 7/23/2007 the appellant argues:

Appellant argues that Gronke does not teach writing descriptors directly to the doorbell by performing direct memory access data transfer operations (see brief page 13 lines 6 – 16).

In reply, firstly, the claim language fails to mention "writing descriptors **directly** to the doorbell ". The word directly is not found anywhere in the claims. Furthermore , appellant has not explained exactly what is meant by writing directly. On page 13 of the brief, appellant only mentions the purpose of writing directly, but again provides no explanation of what "writing directly" means.
On page 16 (1st full paragraph) of the brief, appellant only states what "written directly" does not mean .Nowhere does appellant specify how "writing directly" is carried out.
Secondly, the claims are broad and since the claims fail to provide a clear distinction between "writing first descriptor" and "writing second descriptor" then they are interpreted the same. Gronke discloses the VI consumer sending a send doorbell 25, to VI NIC 18, notify the VI NIC of a descriptor that was placed in the send queue 19 in memory (see col. 3 lines 17 – 22). The descriptor describes data that is to be sent over the network (see col. 3 lines 3 – 7). Receiving the send doorbell enables the VI NIC to directly access the descriptors in memory and transfer the data over the network (see col. 2 lines 59 – 64). Therefore Gronke meets the claim language as presented in the application.

Appellant argues that Gronke does not teach having two ways to ring a doorbell and then perform direct memory access in response to ringing of the doorbell (see brief page 16 lines 1 – 3).

In reply, again the claim language fails to mention "writing descriptors **directly** to the doorbell ". The word directly is not found anywhere in the claims. Furthermore , appellant has not explained exactly what is meant by writing directly. On page 13 of the brief, appellant only mentions the purpose of writing directly, but again provides no explanation of what "writing directly" means. On page 16 (1st full paragraph) of the brief, appellant only states what "written directly" does not mean .Nowhere does appellant specify how "writing directly" is carried out.

Secondly, the claims are broad and since the claims fail to provide a clear distinction between "writing first descriptor" and "writing second descriptor" then they are interpreted the same. Gronke discloses the VI consumer sending a send doorbell 25, to VI NIC 18, notify the VI NIC of a descriptor that was placed in the send queue 19 in memory (see col. 3 lines 17 – 22). The descriptor describes data that is to be sent over the network (see col. 3 lines 3 – 7). Receiving the send doorbell enables the VI NIC to directly access the descriptors in memory and transfer the data over the network (see col. 2 lines 59 – 64). Therefore the Gronke meets the claim language as presented in the application.

For the above reasons, it is believed that the rejection should be sustained.

Respectfully submitted,

Sargon Nano

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